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ABSTRACT

This document presents a series of eight lesson plans (or "learning cycles") for teaching fourth, fifth, and sixth grade students about the Anasazi Indians of the southwestern United States. Each lesson sets forth intended grade level, background information on the key idea and goal, time needed, prerequisite skills and concepts, a lesson outline, and references. Within each lesson is an exploration phase, setting out the overall objective and material needed; an introduction, setting out the procedure to follow and the manner of evaluation; an invention phase, also detailing objectives, materials, and procedures; and an expansion phase, containing similar components. Lessons include: (1) "Anasazi Indians: Pottery & Chemistry"; (2) "Anasazi Environmental Architecture"; (3) "The Land of the Anasazi: Their Natural Resources, Environment, and Climate"; (4) "Geography of the Anasazi Civilization"; (5) "Land Use and Erosion in the Anasazi Civilization"; (6) "Erosion of the Anasazi Land"; (7) "Anasazi's Use of Resources"; and (8) "Relating Anasazi Customs and Sky Patterns." (SG)

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LINKING CULTURE AND ENVIRONMENT: WHAT CAN THE ANASAZI TELL US?

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SO 023 725

ANASAZI INDIANS: POTTERY & CHEMISTRY
A Learning Cycle

Grade Level: Six

Information:

Key Idea: To look at the cultural and scientific aspects of the Anasazi Pottery.

Goal: Gain an understanding of how the pottery was made and used.

Time Needed: 3-4 days

Prerequisite Skills and Concepts

Concept:

1) principles of heat transfer (conduction, convection and radiation)

Skills:

1) Observing
2) Classifying
3) Finding relationships

Lesson Outline:

Exploration Phase

Objective: Students will determine the relationships between modern and prehistoric utensils and how they were formed.

Materials:

play money
various plastic containers (pitchers, bowls, etc)
various samples of pottery (pitchers, bowls, etc)
rusted iron skillet
aluminum foil
sand
H_2O (water)
chunk of coal
ziploc bag with O_2 (or a bag with air labeled as oxygen)

Introduction to Lesson:

Procedure:

1. In groups of three to four, have the students obtain a sample set of the materials above and list all relationships and differences they find between the items considering the key questions:
    a. What are possible relationships among these materials?
    b. How do they differ?
2. Ask each group to discuss their observations and conclusions with the class.
3. Have the students develop a system of classification of the above materials based upon three separate criteria, leading to the formation of the following categories: 1) use, 2) composition, and 3) techniques of formation.

Evaluation:

Each group will turn in their list of observations and conclusions regarding the relationships found.

Invention Phase

Objectives: Students will describe the uses, composition, and the techniques of formation of Anasazi pottery.

Materials:

cross section poster of a gas-fired updraft muffle kiln

The materials from the exploration activity above separated into three groups:

1) "use"
    play money
    various plastic containers (pitchers, bowls, etc)
    various samples of pottery (pitchers, bowls, etc)
    rusted iron skillet
2) composition
    rusted iron skillet
    aluminum foil
    sand
    H_2O
    ziploc bag with O_2 or a bag with air labeled as oxygen
3) techniques and formation
    candle (lit)
    chunk of coal

Procedures:

1. The "Use" of Pottery

   Direct the students into a discussion about the use of the pottery (see materials from group 1 above). Topics addressed shall be:

   a) Why was pottery used for trade as opposed to "money"?

   b) What would the Anasazi be trading for?

      i) area of specialization (famous for pottery)

   c) Why use pottery as opposed to skillets in the past? Why do we use plastic containers/skillets today? (lead into composition)

2. Composition

   Direct the students attention to the composition materials (see group 2 above). The discussion now focuses on the chemical composition of pottery:

   $$A1_2O3 \cdot 2SiO_2 \cdot 2H_2O$$

   The ideas here are to include the Fe_2O_3 which gave the pottery its red color in appearance, aluminum foil to give the idea of aluminum in the aluminum oxide, the bag of oxygen for oxygen in the aluminum and silicon, the sand for the idea of silicate (adding sand changed the color of the clay) and the water which is part of clay.

3. Techniques and Formation

   Direct the students' attention to the candle, coal and the poster of the kiln. The idea here is to generate the discussion of a heat source and the three methods of heat transfer which can be shown in the lit candle and then applied to the kiln.

   The modern kiln is discussed in relation to how it "bakes" the pottery through the three methods of heat transfer.

Closure: The question is posed "What kind of kiln would the Anasazi have used?" and coal could be then used to generate the idea of a heat source.

Evaluation: Students will be evaluated by consideration of a two or three sentence description they have written identifying the type of kiln the Anasazi may have used and the roll of a heat source.

Expansion Phase

Objectives:

1. Students will describe the process the Anasazi used to make pottery and will make a piece of pottery using that process (except the firing process).

2. Students will recognize the need for specialization by comparing the pottery produced by various students in the class.

Materials:

photographs of the Anasazi pottery
clay
soft brush
piece of gourd or shell for smoothing
sharp stick for texturing
kiln
slip

Procedures:

1. The students will be shown pictures of Anasazi pottery and the students will use the coil method to produce a piece of pottery.
2. After completion of the piece, the class will compare their work in order to determine which pieces would be most valuable for trade. This activity would lead the class to discuss who, based upon the piece produced, would be encouraged to specialize in pottery making.
3. Summarize the main ideas of the learning cycle.

Evaluation

Students will be evaluated on their participation and ability to determine who could specialize in pottery making.

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Teacher Contributors: Tecla Borick
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ANASAZI ENVIRONMENTAL ARCHITECTURE
A Learning Cycle

Grade level: Four, five

Overall Objective: The students will describe the environmental impact of constructing buildings beneath the ground surface.

Exploration:

1. Divide the students into cooperative groups of three or four. Discuss the key question "How warm is the soil outside?"
2. Distribute 2 four inch diameter clay flower pots to each group.
3. Have each group glue the 2 open ends of the pots together.
4. Have each group insert a thermometer into the hole in the top of the flower pot. Assign each group a depth to bury their pots outside beginning with one inch and continuing at one inch intervals with the final pot totally submerged.
5. Take children to a predesignated area outside. Allow each group to proceed in burying their pots.
6. Beginning the following morning have each group take an hourly temperature reading of their pot. Readings will be recorded in a journal as checked.
7. Using the recordings from their journals following two days of monitoring the temperatures have each group construct a graph of the temperature changes within their pot.
8. As a class, compare and discuss each group's graph.

Objective: Students will graph soil temperature.

Materials:

Shovel

<u>For each group:</u>
2 four-inch diameter clay pots
glue
thermometer

Evaluation: Examine each group's graph for accuracy and organization.

Invention:

1. Ask "Which pot depth would be the most comfortable to live in right now? Why?" (Note: If it is winter you will want the children to respond by choosing the warmest temperature. If is late spring you will want the children to respond by choosing the coolest temperature).
2. The teacher will introduce/review the Anasazi Indians by locating on a map their location in the Southwest. (See lesson on "The Land of the Anasazi: Their Natural Resources, Environment and Climate" for background information).

3. Using maps discuss the Southwest's temperature and rainfall today and in the 1200's.

4. Have students examine pictures of Anasazi pithouses. Ask them to make inferences regarding the material they were constructed from, their size etc. Ask students to make comparisons with modern constructions such as basements and fruit cellars.
5. Consider the clay pot temperature data and the temperature and rainfall maps. What reason did the Anasazi have for building pithouses?
6. Display pictures of modern apartments. Have the students draw similarities between Anasazi housing and the modern apartment housing.
7. **Closure:** Develop a two-sentence group statement describing the benefits to the Anasazi of building housing partially underground in an apartment style.

Objective: Students will describe the benefits of building housing partially underground.

Materials

Pictures of Anasazi pithouses
USA Map
Pictures of apartments and apartment houses, and basements.

Evaluation: Ask each student to write a statement describing the most comfortable location for a house in terms of temperature on the earths surface, partly below it, or fully below it and evaluate for accuracy based on the data collected.

Expansion:

1. In their cooperative groups the students will devise a plan for constructing a model of a pithouse.
2. Have the students fill a small wading pool with sand.
3. Assign each group an area in the sand.
4. Using play dough, milk cartons, sticks, and water have each group construct their pithouse after they have made a preliminary sketch and decided the depth for the house.
5. Once each house has been constructed for a village.
6. Allow each group to share the class village by choosing one of the following options: writing a play, or performing a puppet show.
7. Have each group share their projects by inviting parents or other classes to a sharing session.
8. Briefly wrap up the learning cycle by summarizing the ideas articulated in the closure.

Objective: Students will demonstrate their conception of an event in an Anasazi village.

Materials:

small wading pool
Sand (enough to fill wading pool)
<u>For each group:</u>
play dough
rectangular school milk cartons (10 or more)
sticks
plastic milk container for carrying water

Teacher-contributors: Lisa Bailey
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The Land of the Anasazi:
Their Natural Resources, Environment and Climate

A Learning Cycle

Grades
five and six

Social studies concepts/skills
the effect of climate on culture
climate affects the survival of a culture
finding patterns hypothesizing
observing
inferring

Science concepts/skills
erosion of bare soil, nutrient depletion, water requirements, climate

Objectives

Students will:

- interpret and relate historical, archaeological, and meteorological evidence of climate related cultural change
- describe how climate affects a culture which is directly dependent on agriculture
- develop hypotheses about how an agriculture-dependent culture might change in response to climate change
- observe and interpret the effects of roots on soil erosion
- observe and interpret the effects of nutrient depletion on plant growth
- observe and interpret the effects of lack of water on plant growth

Rationale:

Interrelationship of skills and concepts: "The first Americans" is a common unit of study in the upper elementary curriculum. Many such units of study do not provide a solid understanding of the concepts and generalizations involved. An integrated lesson provides a better understanding of concepts involved through the use of hands-on activities which increase meaning and relevance for students. The science concepts of erosion, soil nutrients, etc. is essential to an understanding of the part climate may have played in the collapse of the Anasazi culture. This lesson would also develop concepts which are instrumental to understanding current issues such as the role of human activity in global change.

Content background: The Anasazi were the prehistoric people inhabiting the "Four Corners" region of the American South West. The Anasazi population was

most dense in what is now the Montezuma Valley in South West Colorado and South East Utah.

Archeological records date the appearance of the anasazi to around AD 1. During the period AD 500 to AD 700 the Anasazi produced beautiful baskets. Around AD 700 they became more dependent on agriculture and began to move from their pit houses to more permanent settlements or stone pueblos.

The Anasazi culture relied upon domesticated crops of corn, beans and squash as the major food source. Hunting game and gathering wild plants supplemented their diet. for a time, their agricultural expertise in conjunction with favorable climate allowed the Anasazi to settle in previously uninhabitable areas such as canyon rims and drainage deltas among river corridors.

The downfall of the Anasazi occurred around AD 1250. It is believed that a series of droughts, overpopulation, poor soil conservation, and deforestation (to provide fire wood and roof beams) lead to the abandonment of the Anasazi cities, and the inability to maintain their way of life. The remnants of the Anasazi migrated southward to the Rio Grande where elements of the culture as a whole endured in the Hopi, Zuni, Acoma and the pueblo people of the Rio Grande (adapted from "The Tusayan Ruin", 1991).

Instructional model: These activities are intended to be used in an integrated lesson combining social studies and science. This would be part of a unit on climatic change or pre-Columbian America.

Lesson Outline

Exploration: Key question: Divide the students into cooperative learning groups.

Have each group discuss the questions:

"Why did Anasazi move so much and finally dramatically decrease in 11 - 13th centuries?",

"How did the Anasazi treat their natural resources - in this case, soil?", "Do native Americans '"respect"' the land/natural resources?"

Share each group's ideas.

Assign activities relating to the question, "What happens to soil?" to each group, and assign group members different roles. Each group does a different activity and shares the results with the rest of the class.

Materials:

- 2 pans (12" x 18")
- rye grass or corn seed
- 2 clear plastic garbage bags
- brick
- coffee can
- 10 styrofoam cups
- 2 permanent markers
- potting soil/vermiculite
- liquid fertilizer
- medicine dropper

Activity One: Have students fill two pans (about 12" x 18") with potting soil. Plant one pan thickly (one seed per square inch) with rye grass seed or corn seed, and do not plant seeds in the other. Water both pans carefully by sprinkling water on the surface. Place the pans where they will receive light. Check the pans every day to make sure they have not dried out. Add enough water to keep the soil slightly moist. The seeds should sprout in about one week and should have grown several inches tall in two weeks. When the seedlings are about six to eight inches tall: Open a clear plastic garbage bag, form it into a circle and place the pan in the center. Set a brick under one end of the tray so that it is elevated about four inches. Hold a coffee can over the elevated end and slowly pour one gallon of water in. Let the water run down the soil and out into the garbage bag, lifting up the edges if necessary to keep it from running out on the floor. Remove the pan and brick and seal the bag. Repeat the process with another bag and the other pan. Compare the results. Describe the two pans. Are they the same? What is in the two bags? Where did it come from? Do plants have any effect on what happens to soil when it rains?

Activity two: Have the students punch a single pencil hole in the bottom of each of 5 styrofoam cups and label them (A, B, C, D, E) with a permanent marker. Fill them each 2/3 full with vermiculite. Plant 3 corn seeds in each, about 1/2 inch deep and water them thoroughly. Set the cups in a sunny place and let them drain. Check for drying every day, and keep the soil slightly moist. After the seeds have germinated, have the students do this: every school day add drops of liquid fertilizer to the cups; none to cup A, one to cup B, two to cup C, three to cup D, four to cup E. Compare the growth of the seedlings daily. Is there a difference between seedlings grown with nutrients being added and those grown with depleted nutrients?

Activity three: Have the students punch a single pencil hole in the bottom of each of 5 styrofoam cups and label them (A, B, C, D, E) with a permanent marker. Fill them each 2/3 full with potting soil. Plant 3 corn seeds in each, about 1/2 inch deep and water them this way: Add 3 ounces of water to each cup after planting the seeds. Then every school day add the following amounts of water only to each cup: A, none; B, one medicine dropperfull; C, two medicine dropperfulls; D, three medicine dropperfulls; E, four medicine dropperfulls. Most seeds should germinate within one week. Observe and record observations about the growth of the corn seedlings. Are there differences in the growth of the corn in the different styrofoam cups? What different growing conditions do they have? Does the amount of water available affect the growth of corn?

Discuss all three activities.

Invention

1. Present appropriate terminology to facilitate the discussion of the students' results.
2. Present background information focusing on climate and agriculture about the Anasazi. All concepts and skills must be included.
3. Assign each cooperative learning group a research topic. Have them use library materials to construct short (2 page) topic report. Possible topics are Anasazi: food plants, agricultural techniques, building materials, architecture, hunting practices, trade items. Have students present reports and discuss the information.
4. Develop a class concept map on the chalk board, relating the effects of climate on human activity (culture), and the effects of human activity on the environment. Use sample web that follows and +D start off. Use those portions, or all of the sample web, as appropriate.
5. Ask the cooperative learning groups to develop hypotheses about how an agriculture-dependent culture might change in response to climate change. Review the results of the activities carried out in the exploration above. Have students carry out library research on climatic changes occurring in northwest and central Africa and the effects on local cultures. Present information in class. Create a table of possible effects. Then determine whether any of the hypotheses are supported.
6. Closure: Develop together a summary statement describing the likely effects of climatic change on the Anasazi culture. Develop another statement summarizing the likely effects of Anasazi culture on their environment. Develop a third statement that summarized how both the climatic change and Anasazi culture probably effected their environment.

Expansion

Students will work in cooperative learning groups, and choose at least two of the following activities to do:

1. Write an essay to answer this question: "If you could help the Anasazi solve their problem what would you do?"
2. Write a story about an Anasazi farm family who can no longer survive by farming.
3. Role play, "What if we no longer had gasoline (or electricity, etc.), what would we do?"
4. Whole class activity: Discuss how they local community or town (or another community) faces problems similar to or different from the Anasazi.

   and/or

   The class will be divided into group of four or five students. Each group will plant a tree on the school grounds. Each group will have a different tree assignment to do. "How will your tree": Hold the soil; store water; provide habitat; or help clean the air. Each group will be responsible for watering and looking after a tree.
5. Review and summarize the learning cycles main ideas.
6. Closure: Develop together a summary statement describing the likely effects of climatic change on the Anasazi culture. Develop another statement summarizing the likely effects of Anasazi culture on their environment. Develop a third statement that summarizes how both climatic change and Anasazi culture probably effected their environment.

Evaluation

Provide student cooperative groups with a case study of cultural failure related to an environmental issue (for example, Easter Island) and ask the student to explain what the problem was and how it might have been avoided.

Teacher Contributors: David J. Hedgepeth, Terressa Curry, Sabrina Baker.

Teacher Reference:

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Student References:

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GEOGRAPHY OF THE ANASAZI CIVILIZATION
A Learning Cycle

Grade Level: Five

Overall Objectives:

Science: Students will be able to define the terms mesa and erosion.

Social Studies: Students will infer that Anasazi Indians built their homes on top of mesas to protect themselves against animals and enemies.

I. Exploration Phase

Materials: clay, plastic knives, plastic wrap

Objective: Students will form mesas in cooperative groups and hypothesize about how the mesa is formed in nature.

Procedures:

1. Divide the students into cooperative groups of three or four.
2. Give each group a lump of clay on a piece of plastic wrap and a smooth plastic knife.
3. Ask students to form a mountain out of the clay and then use the plastic knives to cut off the top of the mountain.
4. When the groups have completed this, take up the knives and then ask students the key questions: "What are the characteristics of this landform?" and "How do you think nature helps to form this kind of mountain?"
5. As a class, discuss the answers to the key questions.

Evaluation: The teacher will listen to the answers to the key questions and observe participation in the groups.

II. Invention Phase

Materials: picture of the Grand Canyon, picture of a stream with islands, bars, and oxbow lakes, filmstrip on erosion and desert landforms, chalkboard, chalk, wall map of the United States, picture of Anasazi cliff dwellings

Objective: Students will be able to define mesa, erosion and drainage basin. Students will be able to tell some reasons why Anasazi Indians built their homes on top of mesas.

Procedures:

1. Tell students that they just made a clay "mesa". Print this word on the chalkboard.
2. Also write the word "erosion" on the chalkboard. Introduce and define this word.
3. Tell students that mesas are formed by erosion. Large inland seas receded several million years ago, and some of the scars that they left were mesas. As water ran out of that region, it eroded many of the layers of rock, leaving holes, channels, canyons, and mesas.

4. Show students a picture of the Grand Canyon and explain that the Colorado River was responsible for the formation of the large canyon. Point this area out on a wall map of the United States. Explain that the mechanisms which formed the Grand Canyon are the same as those that formed the mesas in the southwest desert.
5. Students will be shown a picture of a meandering stream with islands, bars, and oxbow lakes. The students will be told that the force of friction produced by flowing water causes particles of soil and rock to be eroded and transported away. That is the reason islands, bars, and oxbow lakes form in meandering streams. The students will be told that these are the same erosional mechanisms that formed mesas.
6. Students are shown a filmstrip on erosion and desert landforms (including mesas).
7. The teacher will refer to the word "mesa" on the chalkboard and ask students to give the characteristics of a mesa (i.e. flat, high, isolated). These will be written on the chalkboard.
8. Students will be shown pictures of Anasazi cliff dwellings in the Mesa Verde. The teacher will ask students why the Indians built on top of mesas instead of at the bottom. In cooperative groups, students will discuss this question.
9. The teacher will lead a discussion on the group answers to the question.
10. The students will conclude that because the mesa was high off the ground, it would keep them safe from enemies and wild animals. Another reason was so they could see their enemies from far off. Also, the flat top would be easy to build on.
11. Closure: In a teacher-directed discussion, students should be encouraged to construct definitions of the landform terms. In two or three sentences, students should describe the rationale behind cliff dwellings.

Evaluation: The teacher will monitor student responses in the closure of the invention phase.

III. **Expansion Phase**

Materials: pictures of Anasazi cliff dwellings, clay, plastic knives, plastic wrap

Objective: Students will construct replicas of Anasazi cliff dwellings.

Procedures:

1. Students will remain in their cooperative groups. Each group will use their clay and plastic knives to form replicas of Anasazi cliff dwellings.
2. The teacher will encourage students to imagine that they are building dwellings and discuss with their group members their reasons for building on the mesa.

Evaluation: The teacher will observe participation in the construction activity and ask questions for comprehension while visiting the groups.

Teacher Contributors: Carol McLaughlin, Robert Puckett

LAND USE AND EROSION IN THE ANASAZI CIVILIZATION
A Learning Cycle

Grade Level: Five

Process Skills: observing, inferring, drawing conclusions, experimenting, communicating

Lesson Goals: To familiarize students with the Anasazi and how the geology of their land and natural influences affected their farming practices.

I. **Exploration Phase**

Materials: books, magazines, pictures, videos, filmstrips on Native Americans

Objective: Students will observe and discuss the differences in the farming styles of the Anasazi Indians and other Native American cultures.

Procedures:

1. Divide the students into cooperative groups of three to four. Each group will be assigned a different Native American culture. One group will focus on the Anasazi Indians.
2. The teacher will distribute books, magazines, and pictures to the groups and have them read about and observe the various farming styles of the different Native American cultures.
3. The teacher will show a videotape and a filmstrip on the Native Americans.
4. Student groups will be encouraged to focus their discussions on the key question: "What are the differences in the farming styles of various Native American groups?"
5. Each group will share their observations and answers to the key question with the rest of the class.

Evaluation: The teacher will monitor the discussions for understanding.

II. **Invention Phase**

Materials: stream table boxes, plastic sheeting, water, coffee cans, plant sprayers, sod, soil, straw, jars, 8-penny nails

Objective: Students will be able to explain how natural geological occurrences affected the farming of the Anasazi.

Procedures:

1. The teacher will tell the class that the focus for this lesson will be upon the Anasazi Indians. The teacher will lead a discussion on the Anasazi farming practices and how the geology of the area and erosion affected these practices and their lifestyles.
2. The teacher will divide students into cooperative groups of three to four. Students will be given two different experiments to do. One will be "Erosion and Soil Loss" and the other will be on "How to Slow Down the Rate of Soil Loss". Procedures for the experiments are as follows:

Erosion and Soil Loss:

a. The teacher will give each group the required materials.
b. Students will place stream tables on a table, elevated at the back to give them slope. Plastic sheeting will be fitted onto the stream tables to catch the water runoff. Spouts of the stream tables will be extended over the edge of the table with coffee cans placed under the spouts.
c. Students will place sod into one of the stream boxes and soil that has no grass or plants in the other one.
d. Students will pour water on both boxes at the same time, at the same rate, and from the same height.
e. Students will observe the rate at which the water runs off both samples and the condition of the water in the coffee cans after runoff.
f. Students should notice that grass breaks the force so as not to disturb the soil as dramatically as soil without grass cover.

How to Slow Down the Rate of Soil Loss:

a. The teacher will distribute the required materials to students.
b. Students will fill both stream boxes with the same kind of soil, without grass.
c. Students will cover one box of soil with a thin layer of straw (sawdust may be used as a substitute).
d. Students will sprinkle the same amount of water on both boxes at the same rate and from the same height.
e. Students will observe how much and how fast the water runs off into each coffee can.
f. From a short distance, students will drop water on unprotected soil with a mulch.
g. The teacher will punch a hole in the bottom of a can with an 8-penny nail. The hole will be filled with cotton.
h. Students will put a small layer of soil in two small jars.
i. Students will place a layer of mulch on one and leave the other one bare.
j. Students will place the cans about four feet above the jars containing the soil.
k. Students will put several inches of water in the can.
l. Students will observe the amount of soil that splashes on the sides of the jars, as large drops of water form through the holes and drop on the soil.
m. Students will take two cans open on each end and fill them about three-fourths full of soil, leaving one sample bare and the other one covered with mulch.
n. Jars will be placed under each can.
o. The samples will be sprinkled heavily with water and the students will compare the amount of water that drips through the cans into the jars.

3. Closure: Students will be encouraged to construct three to four sentences summarizing what they experienced in the two activities.

Evaluation: The teacher will monitor the discussions, participation in the experiments, and group interaction for understanding.

III. **Expansion Phase**

Materials: crayons, markers, poster board, pencils, paper, chalk, chalkboard

Objective: Students will determine a method that the Anasazi could have used to prevent erosion.

Procedures:

1. The teacher will divide the students into cooperative groups of three to four and distribute the materials.
2. The teacher will instruct students to produce a diagram and description of a method that the Anasazi could have used to prevent erosion.
3. Students will share their finished products with the class.
4. Students will discuss the various ideas. The teacher will write these ideas on the chalkboard.

Evaluation: The teacher will observe students' finished products and their participation in discussions.

Teacher Contributors: Wendy Ellington, Lori Hughen

EROSION OF THE ANASAZI LAND
A Learning Cycle

Grade Level: Five or Six

I. **Exploration Phase**:

Materials: small boxes (16 in. long, 12 in. wide, and 4 in. deep) lined with plastic, flower sprinklers, water, stick of wood, 1/2 gallon fruit jars (Note: the boxes need a v-shaped spout cut into the end to allow runoff.)

Objectives: Students will observe the effects of erosion on soil due to rainwater, and be able to compare these to the problems of the Anasazi. Students will conduct experiments using boxes of soil and simulated rainfall.

Procedures:

1. Students will be placed in cooperative groups of three to four. They will be asked a key question: "What are some effects rainfall has on soil?"
2. Each group will be given a box of soil, a sprinkler full of water, a stick of wood, and a 1/2 gallon fruit jar.
3. Have students set up their boxes so that the spout on the box is over the empty fruit jar. (This will catch the runoff.)
4. Students will then be instructed to hold their sprinklers one foot above the elevated end of the box and pour water onto the dirt. Students will do this until the water is gone.

Evaluation: Record each student's participation and have each present their group's results to the class.

II. **Invention Phase**

Materials: pictures of Anasazi ruins, diagrams of ancient farmlands of Anasazi, paper, pencils, map of the four corners of the United States

Objectives: Students will describe erosion and provide examples of where this could be detrimental. Students will identify problems the Anasazi encountered due to erosion.

Procedures:

1. The class will be shown pictures of Anasazi ruins, ancient farmlands, and maps of the four corners of the United States.
2. The teacher will discuss rainfall amounts in areas and give some background information on the Anasazi.
3. Student groups will then be presented with the question: "What are some implications, both culturally and agriculturally, of rivers the Anasazi depended on eroding the ground beneath it?"
4. Students will discuss this question in their groups and then finally with the whole class in a teacher-led discussion.
5. Student groups will be required to write a short paragraph, accompanied with diagrams, explaining problems the Anasazi encountered due to erosion.

6. Closure: Student groups will share their paragraphs. The teacher will encourage the class to summarize what has been discussed in two or three good sentences.

Evaluation: The teacher will record participation in the group activity and will evaluate the paragraphs and diagrams.

III. **Expansion Phase**

Materials: boxes of soil, sprinklers of water, 1/2 gallon fruit jars, various shapes and sizes of rocks, tongue depressors

Objectives: Students will apply their knowledge of erosion to problems the Anasazi encountered. The students will formulate remedies for the problems of erosion.

Procedures:

1. Students will remain in their cooperative groups and will be given their materials.
2. Students must use new materials to formulate ways to stop some of the erosion. (Note: tongue depressors will be analogous to shovels and rocks to stones of brick the Anasazi had at their disposal.)
3. Students will then test their ideas and record their findings.
4. Students will share their ways of stopping erosion.

Evaluation: Each group will be asked to measure the amount of sediment in their collecting jar to determine if their method slowed down erosion. Groups will discuss their findings with the class.

Teacher Contributors: Shelton Stalls, Kim Criswell, Cindy Hansford

ANASAZI'S USE OF RESOURCES
A Learning Cycle

Grade Level: Five
Overall Objective: The students will identify materials used by the Anasazi people experience how they used these materials.

I. **Exploration Phase**

Materials: corn, cornmeal, bags of rocks, pint of water, dixie cups, broomstick, four classroom erasers

Procedures:

1. The teacher will divide the students into groups of three to four.
2. The groups will rotate to the following stations in the classroom.
   - A. Station #1 - materials: corn and cornmeal
     Key question - "How can you get from corn to cornmeal?"
   - B. Station #2 - materials: bag of rocks
     Form a structure using the rocks.
     Key question - "How can you make the pieces fit together?"
   - C. Station #3 - materials: one pint of water and dixie cups
     Key question - "How can each one in the group use this water fairly?"
   - D. Station #4 - materials: broomstick and four classroom erasers
     Key question - "Using the handle of the broomstick, can you transport the erasers from one end of the room to the other. If an eraser falls off, you must start over."
3. Have each group list the results of each station.
4. Bring the class back together and discuss what they learned in each station.

Evaluation: The teacher will listen to the answers to the key questions.

II. **Invention Phase**

Materials: Indian dress, a picture of a metate, paper, pencils

Procedures:

1. The students will assemble in the front of the class.
2. The teacher will take on the form of an Anasazi Indian.
3. This will include dress and speech, as possible.
4. The teacher will explain the four basic themes of the stations.
5. The teacher will explain them as the Anasazi used them.
6. Explain to the class how they ground corn using a metate.
7. Show the class a picture of a metate.
8. Tell the class this was a special Anasazi possession.
9. Ask the class what special possessions they have. Discuss.
10. Tell the class of the limited rainfall the Anasazi people had.

11. Remind the students that the Anasazi people were farmers.
12. Have the students describe the water they use in one day.
13. Explain to the students rocks were used to build structures.
14. Sandstone was used to make materials fill in the cracks.
15. Have students discuss materials in their homes. This could include bricks, wood, etc.
16. Tell students that timber and trees were limited resources.
17. Once they used timber, they had no travel to get more.
18. They had no trucks, no wagons and no wheels.
19. Have students discuss life without wheels.
20. Give students opportunity to ask questions of the Anasazi.
21. Have students return to their seats.
22. Closure: Ask students to write a newspaper article describing these resources. Allow students to share these and to construct a summary paragraph as a class effort.

Evaluation: The teacher will listen to the responses to the activities.

III. <u>Expansion Phase</u>

Materials: paper, pencils, ears of corn

Procedures:

1. Have the students write a response to this question, "If the Anasazi people could have had one more resource, what could it have been, and why?"
2. The following three things are to be done at home.
   a. Give each child one ear of corn. Using materials at home, they are to make this into cornmeal.
   b. Interview a family member. Describe the Anasazi peoples' resources to your family member. Record their students' reactions to their way of life.
   c. In chart form, estimate for twenty-four hours the water used by you and your family. Give the students estimates of things like taking showers, washing vegetables, etc.
3. Return the results of the three activities to the class the next day.
4. Show the class the results of activity a.
5. Describe the results of activity b and activity c to the class.

Evaluation: Students will be evaluated on their participation and ability to describe Anasazi resources and their uses.

Teacher Contributors: Ron Steele, Clack Sims

RELATING ANASAZI CUSTOMS AND SKY PATTERNS
A Learning Cycle

Background: The people of the native southwest have their culture grounded in religious and cultural beliefs. Many of these beliefs are connected with things in the sky. Indian people have been looking to the sky for countless generations to divide up their days, bring their harvest, and guide them in their daily lives. Evidence of this is scattered all around the land with sun paintings, kivas and stone caves decorated with stars. These things are of great interest to Archeoastronomers - Those who specialize in the study of ancient astronomical practices.

Objectives: The students will have an idea of how and why the Native Americans, particularly the Anasazi, used astronomy to such a great extent in their culture, how this was connected with their religion, and some practical applications of sky watching. The teacher will bridge the social studies concept of "Indians" with the science concept "astronomy".

Content: Southwest customs, Anasazi, religion, archeoastronomy, time

Process Skills: analyzing, inferring, measuring, observing, concluding, using a compass

Materials: Pictures of sand paintings, sun petroglyphs, ancient sun watching techniques, cave paintings, short excerpts of Indian sky watching techniques or customs involving astronomy, paper, compasses, felt-tip pens, cardboard, wooden stick attached to a base, chart

I. <u>Exploration Phase</u>

Procedures:

1. Divide students into cooperative groups of three to four.
2. Give each group pictures of sand paintings, sun petroglyphs, and cave paintings. Try to pick pictures with obvious astronomical signs like pictures that contain the sun, moon, and stars.
3. Ask students to try to identify different symbols within the pictures, and make a list of the things they see. Present the students with the key question: "What are the different symbols you note in your pictures?"
4. Have students talk about what they think the pictures are communicating. Make a list of common themes that the students come up with to describe the pictures.

Evaluation: The students should see the theme of Native Americans' use of astronomy in their everyday lives.

II. <u>Invention Phase</u>

Procedures:

1. Have students remain in original groups.
2. Give each group a short excerpt of sky watching techniques that show the Anasazi culture and religion. These should include:
   a. How the traditional Indian views the world and its creation.
   b. Different practices to manipulate the sun.
   c. Different beliefs held about the sun and stars.

3. Closure: Each group should write a paragraph to tell about their sky watching technique and report their findings to the class so that the whole class can hear each report.

Evaluation: The teacher will read the paragraphs that the groups turn in.

III. **Expansion Phase**

Procedures:

1. Students may work in groups or individually.
2. Cut the cardboard to 25 cm x 25 cm.
3. Place the stick attached to the base in the center of the cardboard. You should be able to put the stick on the same place each time a new observation is made.
4. Find a sunny area on flat ground to place the cardboard.
5. Using a compass locate north, south, east, and west. Write the appropriate directions on the edges of the cardboard.
6. With the felt pen, trace the shadow of the stick. Write the time of day along the line.
7. Measure the length of the shadow. Determine in which direction the shadow is pointing. Determine where the sun is located in the sky.
8. Repeat the steps four or five times throughout the day. Be sure to include morning, noon, and afternoon observations.
9. Record all data on the chart provided.
10. Have students answer the following questions:
    a. In which direction does the sun appear to move across the sky?
    b. In which direction do shadows move?
    c. At what time of day is the shadow the longest? The shortest?
    d. If you were a Southwest Indian, how do you think this information would be helpful to you since time does not seem to be a dominant factor in your culture?
11. Have students share the answers to their questions.

Evaluation: The teacher will listen to the answers to the questions and monitor the students' participation.

Teacher Contributors: Robin Hinton, Mary Hill